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REMARKS

Claims 1, 2, 6-8 and 11-13 are pending in the application. In the Office Action at hand, Claim 13 is withdrawn from consideration, and Claims 1, 2, 6-8, 11 and 12 are rejected.

The rejection of Claims 1, 2, 6-8, 11 and 12 under 35 U.S.C. § 112, first paragraph are overcome by the amendments to Claims 1 and 8.

Claims 1, 2, 6-8, 11 and 12 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Dukert and Huang. In addition, Claims 1, 2, 6-8, 11 and 12 are rejected under Section 103(a) as being unpatentable over Dukert, Huang and Stewart. Furthermore, Claims 1, 2, 6-8, 11 and 12 are rejected under Section 103(a) as being unpatentable over Dukert, Huang, and Mehnert. Finally, Claims 1,2, 6-8, 11 and 12 are rejected under Section 103(a) as being unpatentable over Dukert, Huang, Stewart and Mehnert. In response to the Section 103(a) rejections, the Applicants respectfully submit that Claims 1, 2, 6-8, 11 and 12 as amended, are not obvious in view of Dukert, Huang, Stewart and Mehnert. Reconsideration is respectfully requested.

Claim 1, as amended, recites an extrusion die including an inner die portion having a male form. The male form has a male complex shape and an axis. The male complex shape has at least four of, peaks and at least a valley, on each side of the axis. An outer die portion is included having a female form. The female form has a female complex shape with peaks and valleys shaped to match the male complex shape of the male form. The female complex shape surrounds and is separated from the male complex shape by a gap. Flowable material is capable of being extruded through the gap between the male and female complex shapes to form a hollow profile. An adjustment mechanism includes an outer member surrounding the outer die portion. At least eight adjustment screws are threaded through the outer member and engage the outer die portion at equidistant angular locations and configured to provide controlled incremental linear and rotational adjustment of the female complex shape relative to the male complex shape for adjusting the gap and for adjusting the position and orientation of the corresponding peaks and valleys of the male and female complex shapes relative to each other

Claim 1 has been amended to recite "the male form having a male complex shape and an axis, the male complex shape having at least four of, peaks and at least a valley, on each side of

the axis," and "an outer die portion having a female form, the female form having a female complex shape with peaks and valleys shaped to match the male complex shape of the male form." Claim 8 has been amended to recite "the male form having a male complex shape and an axis, the male complex shape having at least four of, peaks and valleys, on each side of the axis," and "an outer die portion having a female form, the female form having a female complex shape with at least four of, peaks and valleys, on each side of the axis and shaped to match the male complex shape of the male form." Support for these amendments is found at least in FIGs. 1-3 and 5-10, as well as on page 5, lines 5-15 and page 7, lines 13-25 of the Specification as originally filed. No new matter is introduced.

In one illustrative embodiment of the present invention (FIGs. 1-5), the male 16a form of the inner 16 die portion can have a central axis Y through a center C, and a male complex shape with peaks and valleys, for example, valleys at locations 25 and peaks at locations 27. The male complex shape can have a complexity level of at least four of, peaks 27 and at least a valley 25, on each side of the axis Y. The contours of the male complex shape between the peaks 27 and valleys 25 often extend or curve in a nonorthogonal manner relative to the X and Y axes. The female form 22a of the outer die portion 22 has a female complex shape with peaks and valleys having the same shape as the male complex shape, but spaced apart by the gap 24. The embodiment of the die depicted in FIGs. 1-5 shows a total of 9 matching peaks and valleys, and associated contours, positioned about axis Y, four on each side of the axis Y, and one straddling the axis Y. FIGs. 6-10 depict other possible configurations of peaks, valleys and contours. In the prior art, complex dies with multiple peaks and valleys, including the complexity level of the claimed complex die shapes, were considered too intricate and complex to have a gap that could be properly adjusted with an adjustable die. As a result, in the prior art, such complex dies were made without gap adjustment and material had to be removed from the die gap by hand to obtain the proper gap, a process taking 1 to 2 days. Additionally, in the prior art, sometimes not all peaks and valleys are made to be matching, thereby simplifying the gap.

The claimed invention includes an adjustment mechanism which allows the gap 24 between the claimed complex shapes of the male form 16a and the female form 22a to be easily adjusted so that a corresponding complex profile can be extruded. The adjustment mechanism can have eight adjustment screws 20 which are configured to provide controlled incremental

linear and rotational adjustment of the female complex shape relative to the male complex shape. In some embodiments, more than eight adjustment screws can be employed.

As an illustration, referring to FIG. 5, to make a controlled incremental linear adjustment of the position of the outer die portion 22 relative to the inner die portion 16, opposing adjustment screws 20 along axes X, Y, 40 and 42 can be loosened and tightened to move the outer die portion 22 in either direction along those four axes as shown by the arrows. For example, in order to move the outer die portion 22 incrementally towards position 7 or to the left, along the horizontal axis X, the adjustment screw 20 at position 7 can be loosened and the opposing adjustment screw 20 at positions 6 and 8 can compress or deflect slightly to allow the incremental movement. The incremental movement is typically in the thousandths of an inch. Although the adjustment screws 20 at positions 1 and 5 along the vertical axis Y might possible lose contact with the shifted outer die portion 22, as do those at positions 2 and 4, the contact of the adjustment screws 20 at position 3 and the 45° positions 6 an 8, can prevent unwanted rotation or vertical movement of the outer die portion 22 relative to the inner die portion 16 so that the movement toward position 7 is conducted along a straight path on axis X. In order to obtain further movement, the previously described process can be repeated. In addition, such controlled incremental linear movement can be also conducted along vertical axis Y for vertical movement, or the axes 40 or 42 for 45° movement. If the ultimate desired direction of movement is not directly on the axes X, Y, 40 or 42, then controlled sequential incremental movement of the outer die portion 22 can be conducted along combinations of more than one axis until the desired position is achieved.

The adjustment screws are configured to also provide controlled incremental rotational adjustment of the outer die portion by controlled sequential movement along the appropriate axes and in the appropriate directions. The center point of such rotation can be varied.

By making controlled incremental linear and rotational adjustments, without unwanted rotation or movement, the position and orientation of the female complex shape can be adjusted relative to the male complex shape with precision so that the proper gap on all sides of the male complex shape can be made. In addition, corresponding curves of the peaks and valleys of the male and female complex shapes can be properly positioned and oriented relative to each other on both sides of the axis. As the dies experience wear, the gap can be readjusted to compensate

for the wear rather than the purchasing new dies, as is required when using fixed dies. Furthermore, the gap can be adjusted in as little as one half hour in comparison to the 1 to 2 days required for a fixed die in the prior art.

In contrast, Dukert discloses in FIG. 1 an extrusion die by an inner die portion and an outer die portion for forming simple shapes such as piping or tubing. Dukert does not disclose male or female complex shapes, as claimed. In addition, although a plurality of adjustment screws 96 are described, a plurality can be as little as two, and as a result, Dukert does not teach at least eight adjustment screws as claimed.

Huang discloses a nonadjustable aluminum extrusion die in FIGs. 5, 6 and 7 having a generally rectangular inner male die 112 and an outer female die 114. As seen in FIG. 6, although the male 112 and female 114 dies have complex shapes, the female die 114 has gaps indicated by reference numbers 156 and 164 which are only formed in the female die 114 and do not have a corresponding or matching portion on the male die 112. The gaps 164 of the female die 114 join gaps 162 in a tee shaped configuration. The structure on the male die 112 opposite to the tee shaped configuration is a corner, and therefore, the peaks and valleys of the female complex shape do not match the male complex shape, as claimed.

It is also not obvious to combine Dukert and Huang. In the prior art, complex dies with multiple peaks and valleys, for example, including those having an axis and including at least four of, matching peaks and at least a valley, on each side of the axis, as claimed, were not adjustable. The reason was that with multiple matching peaks and valleys, the contours were considered too intricate and complex to have a gap that would be properly adjusted with an adjustable die. Huang, as previously discussed, is an example in the prior art and is not adjustable. In addition, the components of Huang do not have a configuration that can be modified to be adjustable. Therefore, in view of the prior art, Huang teaches against combining with Dukert. The attached Declaration of James W. Nixon, provides evidence of the unobviousness of combining Dukert with Huang, as well as with Stewart and Menhert, for a person skilled in the art of the extrusion field. In addition, Huang does not have the matching peaks and valleys, as claimed.

Accordingly, Claims 1, 2, 6-8, 11 and 12, as amended, are not obvious in view of Dukert and Huang since it would not be obvious to combine the references together, and neither

reference, alone or in combination, teach or suggest a "male complex shape having at least four of, peaks and at least a valley, on each side of the axis," and a "female complex shape with peaks and valleys shaped to match the male complex shape," and "at least eight adjustment screws threaded through the outer member and engaging the outer die portion at equidistant angular locations and configured to provide controlled incremental linear and rotational adjustment of the female complex shape relative to the male complex shape for adjusting the gap and for adjusting the position and orientation of the corresponding peaks and valleys of the male and female complex shapes relative to each other," as recited in Claim 1, as amended, or similarly in Claim 8, as amended, which also recites "a female complex shape with at least four of, peaks and valleys, on each side of the axis and shaped to match the male complex shape," and "an adjustment mechanism comprising a retaining ring surrounding the outer die portion, and at least eight adjustment screws threaded through the retaining ring." Reconsideration is respectfully requested.

Stewart discloses an extrusion die with male and female dies for extruding a simple tubular or circular shaped film. Stewart does not disclose male and female complex die shapes as claimed. In addition, although FIG. 1 of Stewart depicts eight adjustment screws, it would not be obvious to combine the adjustment feature of Stewart with Dukert and Huang to adjust complex die shapes as claimed, for reasons previously discussed above.

Accordingly, Claims 1, 2, 6-8, 11 and 12, as amended, are not obvious in view of Dukert, Huang and Stewart, since it would not be obvious to combine Dukert with Huang and Stewart, and none of the references, alone or in combination, teach or suggest a "male complex shape having at least four of, peaks and at least a valley, on each side of the axis," and a "female complex shape with peaks and valleys shaped to match the male complex shape," and "at least eight adjustment screws threaded through the outer member and engaging the outer die portion at equidistant angular locations and configured to provide controlled incremental linear and rotational adjustment of the female complex shape relative to the male complex shape for adjusting the gap and for adjusting the position and orientation of the corresponding peaks and valleys of the male and female complex shapes relative to each other," as recited in Claim 1, as amended, and similarly in Claim 8, as amended, which also recites "a female complex shape with at least four of, peaks and valleys, on each side of the axis and shaped to match the male

complex shape," and "an adjustment mechanism comprising a retaining ring surrounding the outer die portion, and at least eight adjustment screws threaded through the retaining ring." Reconsideration is respectfully requested.

Menhart discloses in FIGs. 1 and 2 an extrusion die with male 21 and female 22 dies having an angular gap 18 for extruding a simple tubular or circular shaped product. Menhart does not disclose male and female complex die shapes as claimed. Menhart has four adjustment screws 27 for adjusting the dies.

Accordingly, Claims 1, 2, 6-8, 11 and 12, as amended, are not obvious in view of Dukert, Huang and Menhert, since it would not be obvious to combine Dukert with Huang and Menhart, and none of the references, alone or in combination, teach or suggest a "male complex shape having at least four of, peaks and at least a valley, on each side of the axis," and a "female complex shape with peaks and valleys shaped to match the male complex shape," and "at least eight adjustment screws threaded through the outer member and engaging the outer die portion at equidistant angular locations and configured to provide controlled incremental linear and rotational adjustment of the female complex shape relative to the male complex shape for adjusting the gap and for adjusting the position and orientation of the corresponding peaks and valleys of the male and female complex shapes relative to each other," as recited in Claim 1, as amended, and similarly in Claim 8, as amended, which also recites "a female complex shape with at least four of, peaks and valleys, on each side of the axis and shaped to match the male complex shape," and "an adjustment mechanism comprising a retaining ring surrounding the outer die portion, and at least eight adjustment screws threaded through the retaining ring." Reconsideration is respectfully requested.

In view of the above discussion, Claims 1, 2, 6-8, 11 and 12, as amended, are not obvious in view of Dukert, Huang, Stewart and Menhert, since it would not be obvious to combine Dukert with Huang, Stewart and Menhert, and none of the references, alone or in combination, teach or suggest a "male complex shape having at least four of, peaks and at least a valley, on each side of the axis," and a "female complex shape with peaks and valleys shaped to match the male complex shape," and "at least eight adjustment screws threaded through the outer member and engaging the outer die portion at equidistant angular locations and configured to provide controlled incremental linear and rotational adjustment of the female complex shape relative to

the male complex shape for adjusting the gap and for adjusting the position and orientation of the corresponding peaks and valleys of the male and female complex shapes relative to each other," as recited in Claim 1, as amended, and similarly in Claim 8, as amended, which also recites "a female complex shape with at least four of, peaks and valleys, on each side of the axis and shaped to match the male complex shape," and "an adjustment mechanism comprising a retaining ring surrounding the outer die portion, and at least eight adjustment screws threaded through the retaining ring." Therefore, Claims 1, 2, 6-8, 11 and 12, as amended, are in condition for allowance. Reconsideration is respectfully submitted.

CONCLUSION

In view of the above amendments and remarks, it is believed that all claims are in condition for allowance, and it is respectfully requested that the application be passed to issue. If the Examiner feels that a telephone conference would expedite prosecution of this case, the Examiner is invited to call the undersigned.

Respectfully submitted,

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